Attorney Docket: 27006-0002

OIL PAN FOR AUTOMOBILE ENGINE

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application is based upon and claims priority to Malaysian Patent Application No. PI 2000 6077, filed December 21, 2000, which application is hereby expressly incorporated by reference.

FIELD OF THE INVENTION

[0002] This invention relates to an oil pan for an automobile engine and refers particularly, though not exclusively, to such an oil pan having increased strength.

BACKGROUND OF THE INVENTION

[0003] Oil pans are secured to the lower end of engine blocks of automobile engines, be they internal combustion (petrol) engines, or diesel engines. All engine oil settles in the pan when the engine is not running. Some of the oil is in the oil pan when the engine is running, the remainder being circulated to various components of the engine for lubrication of those components.

[0004] Although the oil pan is bolted to the lower end of the engine block, the oil pan plays a part in the inherent structural strength of the engine and powertrains, particularly in relation to powertrain bending resistance.

[0005] To manufacture an oil pan, three dies are normally used. The third die is at the transmission–end of the oil pan and is used to create large pockets in the material of the oil pan at the transmission end. The large pockets are required for access by the third die. The third die is required for the creation of the necessary components to enable the transmission to be attached, and for the creation of arcuate reinforcement structures.

[0006] To increase the structural strength of the oil pan, as well as increasing resistance to noise, vibration and harshness ("NVH"), requires use of non-flat surfaces. With the use of the third die, that is difficult to achieve.

[0007] It is therefore an object of the present invention to provide an oil pan for an engine, and which has increased structural strength.

[0008] A further object is to provide and oil pan for an engine that has improved resistance to noise, vibration and harshness.

[0009] Another object is to provide an oil pan for an engine which can be manufactured without the use of a third die.

SUMMARY OF THE INVENTION

[0010] With the above and other objects in mind the present invention provides an oil pan for an engine, the oil pan having a plurality of substantially parallel, spaced-apart reinforcement channels extending from adjacent a first end of the oil pan to adjacent a second end of the oil pan, each channel having a base and two sides and an open top; the channels tapering downwardly from the first end and the second end towards an accumulation area of the oil pan.

[0011] The reinforcement channels may be substantially U-shaped, or V-shaped. The angle of taper may be due to the channels being curved with a large radius of curvature such as 2000mm.

[0012] The second end of the oil pan has an end surface that may be planar, and preferably has no tool access pockets therein.

[0013] Adjacent the second end and intermediate the width of the second end, the oil pan may have a region of reduced height. The region of reduced height preferably has a planar portion into which the at least one reinforcing channel does not extend as the planar portion is to

releasably receive thereon a horizontal portion of a substantially L-shaped cover plate. Similarly, the channels may not be in the accumulation area. The cover plate has a substantially upright portion such that when the cover plate is mounted on the planar portion, the substantially upright portion is substantially coplanar with the end surface. Preferably, the substantially upright portion has a securing flange at an end thereof remote from the horizontal portion.

DESCRIPTION OF DRAWINGS

[0014] In order that the invention may be readily understood and put into practical effect, there shall now be described by way of non-limitative example only a preferred construction of an oil pan incorporating the principal features of the present invention, the description being with reference to the accompanying illustrative drawings in which:

[0015] Figure 1 is a perspective view of the oil pan from beneath and one end;

[0016] Figure 2 is an underneath view of the oil pan;

[0017] Figure 3 is a side view of the oil pan;

[0018] Figure 4 is an end view of the oil pan from the direction of arrow 4 on Figures 2 and 3; and

[0019] Figure 5 is a vertical cross-section along the lines and in the direction of arrows 5-5 of Figure 2.

DESCRIPTION OF PREFERRED EMBODIMENT

[0020] The oil pan illustrated is for an engine such as an internal combustion engine. It has a first end 10, a second end 12, and a peripheral, securing flange 14. However, the flange 14 is non-continuous at second end 12.

[0021] There is a main body 6 having side walls 18, a first end wall 20, base 22 and an accumulation area 24 into which oil will tend to drain. A second end wall 26 is provided and

which tapers into a region 28 of reduced height. Region 28 has a floor 30 which, adjacent second end 12 and intermediate the length of second end 12, has a generally flat area 44.

[0022] Flange 14 has a plurality of bolt holes 32 therethrough. To enable reasonable access to those bolt holes 32, side walls 18 and first end wall 20 have concave recesses 34. Additional bolt holes 36 are provided to secure the oil pan in position, with bolt holes 38 being used to attach the oil pan to a transmission casing, and bolt holes 40 being for bolts 42 which are used to secure in place the horizontal portion 46 of an L-shaped cover plate 48. Cover plate 48 also has an upright portion 50 generally perpendicular to horizontal portion 46 and which, in turn, has an end flange 52 with bolt holes 54. Upright portion 50 does not have bolt holes, but horizontal portion 46 does have bolt holes.

[0023] Second end 12 has an end surface 56 which is generally planar. Perpendicular portion 50 is generally coplanar with end surface 56. Surface 56 has no openings therein as a third die is not required, and there is no major volume of material behind surface 56 requiring large pockets or openings to reduce weight, as in the past. Therefore, surface 56 can be more easily machined.

[0024] Extending longitudinally of the oil pan are a plurality, preferably three, reinforcing channels 58. Channels 58 extend from adjacent second end 12 to adjacent first end 10, although the centre channel 64 ceases before flat area 44, and at accumulation area 24.

[0025] Each channel 58 is substantially U-shaped, having side walls 60, base 62, and an open top 66. Base 62 is, preferably, generally flat. However, other shapes may be used such as, for example, a V-shape. The channels 58 preferably taper slightly from ends 10, 12 towards accumulation area 24 to encourage oil to flow to accumulation area 24. The taper may be by curving the channels with a large radius such as, for example, 2000mm. As can be seen, in

region 28 the channels 58 are of significantly increased vertical height compared to that at base 22. Channels 58 continue up first end 10 but reduce in height to flange 14.

[0026] It is also to be noted that at second end 12 the usual "bridge" used to attach the oil pan to the transmission casing has also been eliminated. Channels 58 increase powertrain bending resistance, rigidity and torsionial stress resistance. With the channels 58 extending from adjacent first end 10 to adjacent second end 12, flat surfaces are reduced, thus reducing NVH effects.

[0027] The channels 58 create small, flat areas. This tends to reduce NVH. By channels 58 having differing vertical heights, the oil pan has increased resistance to the various flexing forces on it from different causes such as, for example, the crankshaft, transmission, and so forth.

[0028] Adjacent the accumulation area 24 the channels 58 are of reduced vertical height to assist in minimising oil volume shift during lateral acceleration at, for example, 1g. However, the channels 58 assist in oil flowing to accumulation area 24 due to the taper.

[0029] Furthermore, with the elimination of the use of a third die, the manufacturing operation can use a two die process. This reduces the cost and time taken for the making of tooling; simplifies machining requirements; lowers production costs, may reduce quality variation; and simplifies the machining of end surface 56.

[0030] Whilst there has been described in the foregoing description a preferred construction of an oil pan incorporating the principal features of the present invention, it will be understood by those skilled in the technology concerned that many variations or modifications in details of design or construction may be made without departing from the present invention.